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Zero Retries is an independent newsletter promoting technological innovation that is occurring in Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology. Now in its third year of publication, with 1300+ subscribers.

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Steve Stroh N8GNJ, Editor

Jack Stroh, Late Night Assistant Editor Emeritus

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Web version of this issue - https://www.zeroretries.org/p/zero-retries-0139

Request To Send

Commentary by Editor Steve Stroh N8GNJ

Hamvention 2024, Ho!

Hamvention 2024 in Xenia, Ohio, USA countdown - ~~*19*~~ ~~*18*~~ ~~*17*~~ ~~*16*~~ ~~*15*~~ ~~*14*~~ *13 weeks!*

Ham Radio Weekly Issue 318 - *the Zero Retries Interesting Edition*

I occasionally mention that Zero Retries was born out of frustration that other publications didn't feature enough what I now call "Zero Retries Interesting" stories that "talk up" the technological innovation that is occurring in Amateur Radio. But there are a number of publications that regularly feature Zero Retries Interesting content, and this week I complimented Cale Mooth K4HCK, who publishes Amateur Radio Weekly, on ARW Issue 318 as a very Zero Retries Interesting issue. It would be easier to list the articles that didn't quite make the cut as ZRI, but there were many that did, especially:

- The first Amateur Radio station on the Moon is now transmitting
- AMSAT CubeSatSim beta release
- Exploring SATNOG

- FOSDEM 2024 videos now available
- Radio Interface Board - Sneak peek

So instead of excerpting those articles for Zero Retries, I just recommend ARW Issue 318 in toto to Zero Retries Readers. You'll be busy reading the articles and viewing the videos mentioned in that issue.

Hard Lesson Learned - Snapshot to Wayback Machine, Early and Often

In ZR > BEACON, **RPX-100 Project Final Result - It Seems to Have Just Faded Out** later in this issue, I went back into the Zero Retries past issues for references to the RPX-100 Project. Unfortunately, some of the links I cited relating to the RPX-100 were no longer online, and they weren't retrievable from the Internet Archive's Wayback Machine.

That web articles, etc. that I cite in Zero Retries that aren't archived into the Wayback Machine *is my fault*. Internet Archive makes it *easy* to do so with their Browser extensions and add-ons, which I have installed… but have not been using routinely. Now that I've felt the sting of information that I considered important, but is now apparently non-recoverable, I think I've learned my lesson the hard way:
I will "snapshot" any link that I include in Zero Retries to the Wayback Machine.

Typepad Blogging Platform (Apparently) on Life Support

Talk about impending loss of content in the previous note, in addition to my long term project to migrate Zero Retries off Substack, apparently I'm also going to have to migrate the content of my blogs such as SuperPacket and N8GNJ.org from Typepad to another platform.

Manuel Moreale recently published The great list of all the blog platforms. It was a good list, and emailed him to suggest adding my current blog platform (that I use for everything other than Zero Retries) - Typepad.

To which he replied, succinctly:

> So typepad is not on the list because they're not accepting sign ups.

Glurp! Although the main page looks normal, clicking on https://www.typepad.com/pricing gets this popup:

> **Typepad is currently not accepting new signups.**

Oh… *crap*. That is inevitably a sign of impending death of a platform. I wasn't completely oblivious to this possibility as it's been a long time since there were any substantive improvements to Typepad's capabilities, and (as you can tell from my blogs) its capabilities aren't exactly state of the art.

Likely there will be a "migration" to another platform offered as Typepad was one of the first standards-based blog hosting platforms. But, *any* transfer will *inevitably lose info*. But, damn, I'll miss Typepad because it allowed multiple blogs, including custom domains, for one reasonable hosting fee.

Thus, between moving Zero Retries, the book, and now transitioning off Typepad to… *something*… this will now be a *very* busy year with significantly more butt-in-chair time than I originally planned.

Preliminary Thoughts on National Spectrum Strategy, Pillar 4, Growth of the Spectrum Workforce

I conclude the transcript of the panel discussion in this issue of Zero Retries.

I'll have more to say on this subject in next week's Zero Retries, but I have one profound preliminary thought to offer. As I have been editing the transcript, it struck me that each of these panelists, other than Phil Karn KA9Q, kept talking past the… to me… most obvious point in the world (if they really want to increase the pipeline of the "Spectrum Workforce"):

Encourage participation in Amateur Radio!

To me, it really does seem that simple.

And… the corollary to that is, if the National Spectrum Strategy requires more folks to get involved in the "Spectrum Workforce", doing so is radically easier than the folks on this panel posit, which is:

Dive into the FCC Amateur Radio database and send out postcards to every current Amateur Radio Operator with this simple ask:

Would you like to have a career in radio technology and join the "Spectrum Workforce"? To find out more, go to https://ntia.gov/spectrum-workforce1.

Yes, the vast majority of the recipients would not be suitable for such a career, but some would be that would otherwise never hear about the many "Consider a career in the Spectrum Workforce" programs these panelists discuss. Such a campaign would absolutely precision-target individuals who have, on their own initiative, demonstrated enough interest to study radio technology enough to pass at least a minimal test for a Amateur Radio Technician license.

But that would be too simplistic, too expedient, too inexpensive for these panelists, who (except for KA9Q) are awarded big, multi-year grants to address "the severe shortage in the "Spectrum Workforce".

This quote (paraphrased) seems a good lens to explain this lack of understanding about the elegant simplicity of "*Encourage participation in Amateur Radio*":

It is difficult to get a person to understand something when their salary depends upon them not understanding it. - Upton Sinclair in 1878.

…

A second, more damning prelimiary conclusion is that if these programs were really sincere about wanting to get more people into the pipeline of the "Spectrum Workforce"… why in the world aren't they *advertising / promoting into Amateur Radio*? Why aren't there full page advertisements about the programs they are promoting to let Amateur Radio Operators - young folks, parents, grandparents, etc. learn about them. Why aren't they sponsoring the many YouTube Amateur Radio content creators? Why aren't they running sponsor ads on Hackaday when a radio story is featured? Why aren't they putting ads in Make Magazine? My mind just reels at the stupendous "missed" (perhaps deliberately) opportunities.

On a Few Cheerier Notes…

- It's a clear, *sunny* day here in Bellingham, Washington, USA as I finish up this issue of Zero Retries. In this late era of my life, I'm mostly solar powered - if it's sunny, I'm unreasonably happy.
- I completed a big infrastructure project here in N8GNJ Labs that also has me unreasonably happy, that with this project completed, I'll be able to work on the many queued up projects much more efficiently and collaboratively.
- I finally identified a source for a key piece of hardware, the lack of which being generally available, has (in my opinion) been stifling progress on Amateur Radio technological innovation. It will take some time to tell that story, so it's deferred to the next issue of Zero Retries. But I'll say this: ***I… am… JAZZED… about this development!***

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Brief Commentary on Crucible Of Communications, Part 2

By Steve Stroh N8GNJ

*In **Zero Retries 0138**, ZR > BEACON, I mentioned the article Crucible Of Communications: How Amateur Radio Launched The Information Age And Brought High Tech To Life Part 2: Hams Bring Real-Time Communications To The World by Theodore Rappaport N9NB. In the days after publishing that issue, I had enough time to carefully read the entire article, and in my opinion, it's a stellar study of the influence of Amateur Radio Operators on the evolution of technology that's now widely used by society.*

Given that my primary interest in Amateur Radio is use of the VHF / UHF bands, I was particularly fascinated to read about the history of Amateur Radio repeaters beginning on Page 21 of the article:

> One of the more important developments made by FM enthusiasts in the ham radio hobby was the creation of the FM repeater (also called a digipeater) and the use of an autopatch (an automated phone patch) that would serve a local geographic area the size of a large city or county. Repeaters had already been developed for the commercial land mobile radio industry after the discovery of FM to facilitate mobile fleet and public safety applications, leading to the creation of trunked mobile radio systems [24]. Yet, until the advent of FM, virtually all of the spectrum used by hams had been between the range of 1.8 to 30 MHz (the HF bands, also known as the shortwave bands). FM provided superior audio quality, eliminated the fading that was commonplace on the already popular CW, AM and single-sideband (SSB) modes, and allowed hams to experiment with television and data signals using much greater bandwidths than was allowed at HF.

I disagree with N9NB that the terms repeater and digipeater[2] are equivalent. I was also under the impression that repeaters based on Amplitude Modulation (AM) existed prior to FM repeaters, and that FM repeaters only became popular when commercial VHF / UHF FM radios became available as inexpensive surplus, such as when fleets operators (taxis, police, fire) began upgrading their tube-based mobile radios with more reliable (and less demanding of vehicle electrical systems) transistorized mobile radios. Both of these points are minor quibbles.

But this description really fascinated me:

> In just a few years, by the late 1960's, the entire planet was blanketed with UHF repeaters run by hams sponsored by ham clubs, that allowed any amateur operator, anywhere, to have instant voice communication with local hams over a repeater [52]. One of the truly amazing features about the global ham radio repeater buildout is that many of these repeaters were equipped with an autopatch feature, which allowed ham operators to make automated touch-tone telephone calls from their car or mobile walkie-talkie. The birth of the cellphone industry, and as shown in Part 3 of this series, in fact much more, can be traced to this global repeater buildout by the ham radio community.

As a young new Amateur Radio Operator in the late 1970s / early 1980s, Amateur Radio repeaters on the UHF band were still pretty exotic (at least in Ohio), thus the 6 meter (50 - 54 MHz) and 2 meter (144 - 148 MHz) bands were the initial bands that filled up with Amateur Radio repeaters, but again, that's a quibble.

Despite the significant reduction in use, and no compelling reason for autopatch in the current era of ubiquitous personal mobile telephones, this "global ham radio repeater buildout" remains largely intact. In my opinion, the widespread coverage of repeaters is one of the most significant features of modern day Amateur Radio, that the average Amateur Radio Operator can almost always access *numerous* Amateur Radio repeaters using a modest Amateur Radio VHF / UHF mobile radio with 25 watts transmit output.

And, to offer yet another gratuitous plug for Digital Library of Amateur Radio & Communications (DLARC), a lot of the early media such as magazines and books that N9NB cites in his extensive footnotes can be read online in DLARC.

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Image courtesy of National Telecommunications and Information Administration

NTIA 2024 Spectrum Policy Symposium - Pillar 4 Panel Discussion Transcript, Part 2

Transcript extracted from YouTube (2024 Spectrum Symposium - Afternoon Session), cleaned up, formatted, and (lightly) edited by Steve Stroh N8GNJ

The National Telecommunications and Information Administration (NTIA) held its sixth Spectrum Policy Symposium at the National Press Club in Washington DC on February 1, 2024. This year's Symposium will focus on implementation of the National Spectrum Strategy, including panel discussions aligned with each pillar of the strategy, highlighted by keynote remarks from policymakers from the White House, Congress, the Department of Commerce, the Department of Defense, and the Federal Communications Commission. The portion of the symposium relevant to Amateur Radio and its potential role, is:

Pillar 4 Panel Discussion: Growth of the spectrum Workforce, Increased Understanding of spectrum, and Raised Awareness of spectrum's Importance to the Country.

My thanks to the Internet Archive for making this video available in a permanent state, not subject to the vagaries of individual YouTube channels, advertisements, etc.

https://archive.org/details/ntia-spectrum-policy-symposium/08_Pillar_4_Growth_of_the_Spectrum_Workforce_0001.mp4

Moderator: Phil Murphy

The Strategy has identified a clear vision for raising the profile of spectrum as a career field and for greater awareness by Congress, policymakers and the general public. The call is for ambitious education and workforce development goals, including the creation of a National spectrum Workforce Plan.

Panelists:

- RJ Balanga, Deputy Director, spectrum Policy and Planning Division, NASA
- Dr. Sheryl Genco, VP–Advanced Technology, Ericsson
- Phil Karn [KA9Q], President, Amateur Radio Digital Communications (ARDC)
- Dr. Nick Laneman [ex-KC9NAJ], Director of spectrumX and Co-Director of the Wireless Institute at University of Notre Dame.

Continued from **Zero Retries 0138** - NTIA 2024 Spectrum Policy Symposium - Pillar 4 Panel Discussion Transcript, Part 1.

Murphy:

Sheryl, I know this has been like a particular passion for you, getting kids not just involved in engineering, but STEM in general. I was curious how you see targeting kids for STEM as a pathway to get into these fields?

Genco:

To say passion is an understatement. I've created a K8 math science charter school. Over 20,000 kids have gone through that K8 school already. I think it was Nick who said you got to get them early, right? You got to get them hooked earlym you got to have fun… was it you Phil? It's one of these two. That was really something; that was two years of my life while my kids were eating peanut butter and ice pops. Nonetheless, I was so passionate about it and I'm so thankful that it's still there. I developed the curriculum, the scope, and sequence. It lives on in infamy, so to speak, but it's won all kinds of awards and I'm very thankful that public school is in existence.

I also want to say that these two guys didn't really answer your question, right? One of these things is not like the other up here, and that thing is me. I'm the only one up here who happens to be a woman, who happens to know what it's like to be a girl in engineering. I think if Monisha is still in the audience, she can attest to our fantastic reception at IEEE MILCOM last year. I had Dr. Monisha Ghosh and Dr. Mary [surname?] and myself on stage to welcome those recipients of the 2023 Women in Spectrum Scholarship. I think the power is in us women, speaking about our accomplishments, our patents, our technical work and that gets these other young people, whether they're girls or boys, men or women, excited about the field.

I know Minisha and Mary would also agree with me because we had quite the event. We had a 900 person standing ovation. If you want statistics about engineering and electrical engineering I have them all, and they're terrible. We have to do something as a country to get more electrical engineers in the pipeline and more Electrical Engineers who have actually taken Field Theory. The National Spectrum Consortium committee that picks the scholarship winners pretty much hates me because if a student doesn't have Field Theory on their transcript, I put them in the trash, because that is the intent of the scholarship. The intent of the scholarship is around strong Electrical Engineering people who understand Spectrum, Field Theory, period. That's the intent of it. So those are some of the ways that I've personally been a proponent of that, but I think overall our country needs to find new ways to get more and more people into Engineering, into STEM fields, into perhaps ancillary fields such as these centers of excellence that Ericsson has. As far as tower climbing and technicians they're all super important.

In Colorado, I am also on the Board of Directors for Colorado Labs. One of the things we all get together and talk about… there's industry, and the laboratory directors, and things, who talk about the need for really advanced technicians, really advanced folks who can help with all of the problems that we have building satellites, radios, etc. across the board. There are some unique programs out there. But it's a soup-to-nuts responsibility for all of us to get people interested in those fields and and really excited about it in some way. I don't know if that's answered your question, but for me it's a real lifelong passion and I want to thank Monisha.

As far as NSF goes, just one other thing. I had the luxury of being on stage at the Capitol building with Ponch[?] and what we were talking about was this very very idea, because there is, through the US Chips and Science Act, one of the recipients is a consortium of colleges where all of the deans happen to be women Deans of Engineering. It's called Edge Consortium. Ponch and I were on stage to talk about how do we encourage STEM, how do we encourage Engineering? This was funded through [the] Chips and Science Act because of the semiconductor aspects of it. I really want to thank NSF as well as all these other initiatives that you're doing, and others for supporting those very important concepts of getting people in there young [and] keeping them in engineering. How many of us who are Engineering know about the weed out classes that first semester?

[It's] so, so critical to that conversation with Ponch[?] was about internships. Open your companies, open your minds to having interns come in and really work. Every single one of the seven recipients of the NSC scholarship had some form of an internship - a research program, an internship, someone who took her under her belt… their belts, and really showed them what to do. To your point, gentlemen, that's where they got the excitement, that's where they decided to really stay in Engineering. So really try to find those ways to have internships for students because that's really our future.

Murphy:

It's a great point and I think, beyond equity, it's about leveraging human capital. We need to find talent, we need to use talent, and particularly find people, and populations, that haven't really participated in these sectors of the economy. Because, that's where the real growth potential is.

RJ I know you this is also a real passion for you too.

Balanga:

My colleagues to my left, I totally agree with their initiatives. The STEM community has grown throughout the ages. We have recognized that, and I really applaud all the things that Sheryl and Manisha are doing - engagement with women into the STEM field and spectrum, raising that awareness. We need to leverage more on that. I'm not going to talk about that a little bit more, but being the only Federal employee on the panel, I'll talk a little bit from a different lens. Trying to get women into Spectrum Engineering or Spectrum Management, into STEM, reaching out to the tribal communities. What kind of initiatives can we do to help that out? Through the recruitment phase, sometimes it's very difficult for somebody that doesn't know… they only know what they know. I really love working with the education system, developing curriculum, developing courses; that is widespread. You teach, you give an idea, you give a curriculum to the physics professors. Then, that way, that is outreached through [the] Education community down and outwards. But, also up and in, that will create those interests into those underserved areas and minority areas.

From a recruitment standpoint, unfortunately the pandemic has provided us… there is a silver lining [that] we have opportunities for remote work, we have opportunities for hybrid work environments, broader participation in forums such as this - those online watching. We need to also ensure that there is enough awareness in those communities that they listen to some of you… the symposium today… also leveraging some of the other initiatives. Sheryl and Nick and Phil already have talked about some of their initiatives. But, we are engaged, and I know NTIA is very engaged with the US Telecommunications and Training Institute. They're outreaching to developing nations on their spectrum needs. That's another insight, where we need to go there.

Overall, from a Federal government standpoint, we can't wait for those individuals to come to us. We need to be outreaching to them because, again, they only know what they know. If they don't know, we need to be more proactive, be more forward leading, and reaching out to those communities.

Murphy:

It's a great point. Part of the [National] Spectrum Strategy calls for the creation of a national Spectrum Workforce plan and its focus not just on training and recruiting of RF Engineers, but that full range of technical, operational, and policy positions that's needed to run robust spectrum programs.

RJ, at NASA you guys rely on spectrum for everything, right? We think about a rocket launch, and it's not just a pile of fuel with a capsule on top. There's enormous amount of spectrum that's used at every phase of the process. Keeping that satellite in orbit from your perspective, and your organizational perspective, why is it so important that we have a plan that's broad, that encompasses this really broad workforce that can fulfill a wide range of roles?

Balanga:

Great question. One of the things that we've recognized under SPEARS, and in our activities, is that spectrum has changed. The way we did spectrum 10, 15 years ago is not the same spectrum that we do today. We've made a paradigm shift from using spectrum management because it's either you have some technical management type skills or it's typically related to Engineers. I like to call them spectrum professionals because that's more inclusive of some of the activities that we're pursuing. Under our current plan, the development of a national plan needs to be robust.

I'm going to try to hammer this a few times but the top three things that we engage with or we use under SPEARS. One, we educate. Two, we engage. Three, we outreach. In any community that we're talking to, whether it's engineers, whether it's lawyers, whether it's the young STEM community… kids in the community… the four target audiences that I talked about under SPEARS previously. We look at ways to educate, ways to engage, and ways to outreach. To be broad, again. and going back to the Spectrum Professional environment,we need technicians, we need the technical, we need those who know how to code. Maybe they're computer scientists; they need to do Matlab, they need to do calculus in programming to develop compatibility software. Beyond that, there's the regulatory, the policy, and financial. With auctions going on and the spectrum relocation funds, you know you need to know how to budget a checkbook, and get those numbers over to you.

With that, under the Spectrum Professional environment, or a monitor, there's opportunities to also learn. You have to learn different types of things that you don't know that they learn. These individuals have their skills… disciplines… that they learn but we're also identifying what I like to call the power skills. Others call it soft skills, but power skills… we need to identify negotiation and diplomacy type skills. Getting to yes, especially in those international meetings. Then, crucial conversations, just to name a few, as an engineer myself coming up through this area. I go to a domestic regulatory, or go to an international meeting… Previously I'm not aware of these tools that are available. So we need to identify these tools and ensure that the Spectrum Professional community [has] access to these tools and and training modules as well.

Murphy:

I think this kind of goes into the last strategic pillar of Pillar Four which is improving policymakers' understanding of spectrum. I'm a policy maker myself who's worked on spectrum and Capital Hill for many years. I appreciate how complex it is to try to understand these issues and grapple with some of these technical questions.

I think we're here before a bunch of policymakers. What message would you give folks to help them better understand this critical resource the the opportunity it presents? Because, increasingly, we're seeing, and the strategy is a great example, that policymakers really are given a lot of choices. Sometimes people feel like it's a zero sum game, some people feel like it's an either / or. For you who here on the panel, where you've worked and innovated and created new solutions, sometimes it's not so black and white. Sometimes there's new solutions that people haven't thought about. I'd be curious, starting with Phil at the end, what you would say to policymakers here about that?

Karn:

The first thing I'd say [is] look, this is not a zero sum game. There are often ways to cooperate. We heard this from a Qualcomm gentleman this morning, I guess not a coincidence… you've been saying this since I was there. Very often technology can solve the problem; not always, but very often. If you've got A and B and you're competing over one piece of spectrum sometimes going to a different technology, doing things differently can let them both operate. I know when it comes to a policymaker, especially one who does not have a really deep strong technical background, they may not realize that it does not have to be a competition… well it's always going to be a competition… but there's often a way to give each side most of what they want.

That's probably the most important thing when it comes to spectrum allocations. I've seen these battles from one side… actually, I guess from two areas, through my job and through Amateur Radio for a long time. Very often these things turn into headbutting contest. They don't have to.

Murphy:

[I] totally agree with that.

Laneman:

I thought Phil was going to suggest that everyone should get a ham radio license.

Genco:

I was going to sell my Ericsson stock if he did.

Laneman:

I guess my key message for policymakers would be "ask more of academia". I think there's a growing collection of faculty who see this. Higher education is in a bit of a difficult spot these days depending upon how you look at things. Spectrum is an area where academics with some knowhow, either in physics, or electrical engineering, or computer science, political science, economics… they can contribute to the conversation. They can help distill some of the complexity, and it turns out that there's a collaboration going on between NSF, NTIA, and FCC to ensure that this thing called the Spectrum Innovation Initiative at NSF is successful. There's this thing called the National Spectrum Strategy that we get to work together collaboratively to try to structure these. Ask more of Academia. Give me a call; I'll put you in touch with someone who might have the expertise you're looking for.

Murphy:

Which is why we did a listing session at SpectrumX while we were developing the Spectrum Strategy. I'll make a plug for you. Sheryl?

Genco:

This is hard because now I'm in a public company, but when I was at NTIA it was really pretty interesting because we did have the occasions to be called in and talk to different committee members. That was really illuminating because after a while I would get calls as the quasi-CTO for NTIA running ITS. I would get calls about things like chips and quantum because I used to run a quantum development for Honeywell and it was really great because they reached out and had a resource that they trusted as part of NTIA. But, as a commercial person I try to speak truth; I try to give NTIA and FCC the best of

our engineers and the best of our modelers whenever I can. [I] try to participate in the PAS[?] Initiative with DOD and NTIA. It's really hard as a commercial company because I think we're looked at as a commercial company with some suspect. Are you trying to sell something? What are you trying to give us? Whereas I personally always come at it from the purity of the science and the purity of the engineering. It's a difficult question for me.

Murphy:

It's fair.

Balanga:

One of the other things that we've been doing apart from SPEARS… SPEARS was more reaching into what we do at NASA to develop our Spectrum Workforce… One of the things we initiated back in 2021 was also what we call the Spectrum Workforce Development Forum. That was a cross-agency cross-departmental effort to engage and take a look at what different organizations are doing, leverage on those so there's [the] least amount of duplication of effort, better investment, and better efficiency of taxpayers monies. Then, moving together collaboratively, it was done informally. We had such good partnerships in that. Everyone's interested, everyone knows and recognizes these challenges. They make their own free time even though their plates are already full. They came up and joined [the] Spectrum Workforce Development.

We have the opportunity now; it's epitomized here in the National Spectrum Strategy and I really want to thank Coop[?] and NTIA and your leadership for recognizing that this is a critical challenge, putting into the strategy there is no excuses going back. My one request to other policymakers out there - please provide the advocacy, please provide the critical investments in order for us to engage and create the activities to make Pillar Four a success for the National Spectrum Strategy. That will help invest into this current Spectrum Workforce and also the next generation of spectrum professionals.

Murphy:

I would just say [that] RJ was a real driving force behind this pillar so we definitely appreciate your leadership here.

Just to close out, I'd just like to give each of the panelists an opportunity to offer any final thoughts they have here. RJ why don't you go ahead.

Balanga:

We've been going at the NASA SPEARS for five years now. The Spectrum Workforce Development, going on three years. There's a lot of challenges… there's a lot of things. We worked with SpectrumX, we worked with a couple of folks from NSF as well. They try to do a brain mapping exercise of what Spectrum Professionals is. The gentleman got down… I think he spent about three months working on this… got down to a point where a big whiteboard was already full and he had barely scratched the surface of 10% of what Spectrum Professional is.

There's so much here; it's a lot to unpack, many many challenges. But, through the leaders that we have up here today, the leaders that we have out there and online, we need to start collaborating, working together, and start chopping and niching away at all these different challenges. Hopefully someone at NTIA that's developing the plan and executing the plan will be able to make sense out of all of this and make headway, identify the activities that are impactful, they're implementable, and they're very actionable.

Genco:

Thank you. For me I think I would like to see everyone in the audience try to mentor one person. Whether you're an attorney, whether you're a policymaker, or an engineer; mentor one person and get one person excited about it because there's possibilities in spectrum, there's possibilities in STEM. Our nation's future really relies on our ability to stay at the forefront of technology and innovation. Quite frankly, some of the speakers this morning were talking about that. Dr. Propacar[?] was talking about that for sure, and I know Dr Ponch[?] really believes in that over at NSF. I would like to say that every one of us has a role to play in our Workforce Development. Every one of us has a way to get someone excited about spectrum, about engineering, about technician work, or about other adjunct professional careers that RJ was talking about. You know, I'm the one who laughed at the Megahertz joke this morning.

I don't know what that says about me, but at the same time, reach out to me, reach out to Dr. Gosch[?], reach out to Mary Sherga[?] at DARPA because we're here to really support underrepresented people, women especially, in these fields.

I know for my daughter's sake it's hard being in a class with a bunch of guys. It's hard being in the Robotics Club when there's a bunch of guys who mostly resemble the people on The Big Bang Theory. So please help people - I did. Anyway, help the next generation.

Laneman:

Just having fun with you Sheryl. She stole my line. I just wanted to say if you told me 15 years ago that I would be at this table, I wouldn't believe you. I became curious about spectrum and spectrum issues around the TV White Spaces era and I was fascinated that it wasn't just a technology problem. As a maybe prideful engineer, I thought yeah we should be able to solve that problem. It took years and it didn't really pan out from a technology point of view. Then there was a policy innovation. So I fell in love with the field and I've gotten pulled into it more and more over time. Mentoring is a big ask; I was going to suggest that everyone in the room and everyone online try to identify ten young people - roughly six middle school or high school kids, roughly three undergraduates and maybe a graduate student or even a faculty member and point them in the direction of the National Spectrum Strategy. Just nudge them, encourage them, maybe give them a little guidance, maybe mentor them. If enough of us do that we could have a thousand scholars like that.

I think that would be a big step in the direction of raising awareness, building interest, and pointing people into this direction of a number of career opportunities that will ultimately contribute in a very meaningful way to the success of our nation. Thank you.

Karn:

I'll get it out up front - get a ham license, OK? That's that's a given, I don't want to say that again.

Laneman:

Can we take a test today?

Karn:

If you like; I need three volunteer examiners. Seriously I do believe that Amateur Radio has a very big potential role to play here. That's why I was invited

here. I don't think we're realizing anywhere near its potential. It's primarily educational, yeah, but even there I think we could do a lot more than we are doing. We need to involve more teachers, get more clubs started. Kids today have enormous demands on their time. They have many many things going on and that is a challenge. It's bigger than when I was in high school, at least as I remember. But if you make it interesting enough for them they'll come back. We found… actually we were surprised… to find that about half of the kids who come back every week to our ham club meeting are female. All you have to do is make them feel welcome. Make it interesting, they'll come back and they'll keep coming back.

Getting their ham licenses; we fly balloons so every time a new student gets her ham license we put her callsign on the transmitter so when we launch it they'll be turn[?], that kind of thing. Little things like that actually matter. We're looking for more ideas. We would love to have suggestions on other things, other ways we could use the amateur service to get young people involved. We're thinking about it all the time, but I'm sure there are some that we've missed.

But [also don't] forget the potential of the ham service to contribute to direct experimentation with some of the problems you're talking about. In the amateur service no one station owns a frequency. We have to sign every time we renew our licenses - it says no amateur station owns the frequency. We have to share so we've already had to deal with these problems of spectral sharing, mutual interference, and dynamic allocation for a long time. I personally have gotten very interested in trying these out on the ham bands. In 1990 I came up with one of the techniques for dynamic spectrum sharing. [That] sounds an awful lot like what I've been hearing recently about where you get on and say "Hey I need to listen here for a certain period of time, please stay off that frequency." I did this in 1990; I was doing it for ham radio. I didn't know… had no idea that anybody would do anything like that. Later it made its way into Wi-Fi; it's one of the features of Wi-Fi.

So we do have potential not only for education I think but some small scale experimentation especially in the fields where apparently other people were having problems. I was surprised to hear about problems with communication between different groups who are sharing the spectrum or in going through the kinds of regulatory approvals you need to to operate a new waveform. Hams have a lot of regulatory flexibility as long as we stay within rules (one and a half kilowatts maximum power output), we have to stay in the band, stay in the bandwidth limits, [and] don't intentionally interfere with anybody. We can do pretty much what we want and that does seem to be a very big advantage of the ham service. So on a small scale and perhaps on an academic scale we can try some of these things and I'm certain we would be delighted if some of the results were useful to the larger spectrum sharing community. Because, we know, more anybody, that the spectrum is limited. We see pressure on our spectrum all the time and we want to make ourselves… we want to justify what we have.

Murphy:

First of all I want to say thank you to the panel and thank you for sharing these insights with the folks here and online. I hope for people watching, you gain an appreciation for how important it is that we're not just addressing the spectrum pipeline, we're not just thinking about new technologies, and we're not just thinking about ways we can coordinate better. Ultimately there's this issue of human capital. How can we leverage talent and interest and fun to really create new opportunities to really drive this technology forward, and ultimately for the country to continue to succeed and lead the way.

I want to thank our panelists again for all of this and thank you all. Have a good one.

…

NASA SPEARS - Spectrum Education Awareness - https://www.nasa.gov/directorates/somd/space-communications-navigation-program/SPEARS

SpectrumX - An NSF Spectrum Innovation Center -

https://www.spectrumx.org/

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ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of Zero Retries Interesting items.

Amateur Radio Is… On… *Luna!!!*

This is about as cool, as *Zero Retries Interesting as it gets!* I was unaware of this project of the Japan Aerospace Exploration Agency (JAXA) Ham Radio Club (JHRC) until the announcements came out.

Some good links for further reading:

- JAXA LEV-1 Page
- JHRC Ground Station
- **Hackaday** - Decoding JS1YMG: First Ham Radio Station on the Moom after SLIM Mission
- Daniel Estévez EA4GPZ / M0HXM - Trying to decode LEV-1

Best pull quote from EA4GPZ / M0HXM:

> The information about the telemetry signal of LEV-1 is scarce. Its website just says
>
> Telemetry format of LEV-1 stands on CCSDS. The contents of telemetry are under developing.

(This is one Amateur Radio Operator who *really* loves a challenge!)

It was amusing to note this when looking up JS1YMG on QRZ.com:

> This call sign record has incomplete details: country.

It's a milestone that "on planet Earth" can no longer be assumed for Amateur Radio station locations.

Best of all, now *all of us Amateur Radio Operators* have a new bragging point. Not only does Amateur Radio have dedicated satellites in orbit, and can bounce signals *off* Luna… now *there is an Amateur Radio transmitter **on Luna**!* Yes, it's short lived, yes it's "only" transmitting telemetry, and yes it's transmitting at very low power… but *it's a start*! OSCAR-1, the first Amateur Radio satellite, was similarly modest in scope.

ARISS Packet Radio System Now Online

On Mastodon from @ARISS_Intl:

> From our team members at NASA:
>
> Might want to give a listen on 145.825 as it appears that the SM #hamradio D710GA has been reinstalled and is now active with packet operations.#APRS #ISS
>
> Any reports?

ARISS is Amateur Radio on the International Space Station.

VU2TUM confirmed reception of the ARISS Packet Radio system.

Nominations for Amateur Radio Software Awards Due By 2024-02-29

I think this should be renamed Amateur Radio *Open Source* Software Awards, as Open Source *is* a primary qualification.

> The Amateur Radio Software Award is an annual international award for the recognition of software projects that enhance amateur radio. The award aims to promote amateur radio software development which adhere to the same spirit as amateur radio itself: innovative, free and open.
>
> Nominations for the 2024 awards must be submitted by February 29, 2024. Please use the awards nominations form to submit your nominations. The award rules and the faq are good resources to ensure your nominations are eligible and may answer any questions you have.
>
> The [Amateur] Radio Software Award is in its fifth year. Past recipients were Anthony Good (K3NG) for Arduino CW Keyer, Jordan Sherer (KN4CRD) for JS8Call, David Rowe (VK5DGR) for Codec 2, and Stephen Loomis N0TTL and the GridTracker team for GridTracker. Checkout the Award Recipients page for more details about the past recipients.

One thing not mentioned in the FAQs is whether multiple nominations are allowed. Thus I'll assume that multiple nominations are acceptable, and I plan to do so. There are *so many* good open source Amateur Radio software projects in progress at the moment!

FreeDV is Hiring a DSP Engineer

Mooneer Salem K6AQ on the digitalvoice mailing list (and others):

> The FreeDV project is looking to hire a DSP engineer! This person will be responsible for helping to develop the next generation of open source HF digital voice. Funding for this opportunity will be provided by the ARDC grant awarded to the project (thank you again!)
>
> More information about this opportunity (including how to apply) can be found at http://bit.ly/freedv-dsp-engineer-job-listing.

"De-bit.ly-fied" URL: https://k6aq.net/freedv/jobs/FreeDV_DSP_Engineer_job_listing.pdf

In the job description document, it actually says:

> We're looking for two DSP Software Engineer (Contractors)…

This is *notable*! In developing new technology for use in Amateur Radio, we don't suffer from… a lack of Amateur Radio design and engineering talent… but rather that such talent that is in *very* high demand… as in revenue-generating work. I have friends that are in this situation, and I don't blame them for focusing on the "revenue" work. Amateur Radio didn't used to have to compete with such high demand for skills such as FPGA design, VHF / UHF / Microwave transmitter design, DSP software, etc. Now, it *does*. And now, what is rebalancing that issue, is that grants are available from ARDC to enable paying "talent" (sometimes not Amateur Radio talent) to do such work *on behalf of Amateur Radio*.

Kudos to FreeDV project for this milestone!

A Few Pointers on LoRa and Meshtastic

Email from Zero Retries reader Rich Casey N5CSU:

> Not sure if you've been following the LoRa stuff but it sure seems to be taking off. I stirred the pot with my local club and thought I would pass along to you.
>
> I ran across this website while investigating Meshtastic equipment:

http://heywhatsthat.com/

If you're interested in learning more about the Meshtastic stuff, check out:

https://meshtastic.org/

This UK ham's YouTube channel has a great demonstration and a bunch of follow up videos:

There's a new website called meshmap.net that just went live:

https://meshmap.net

And 1000 new people have joined the Meshtastic Discord channel in the past week! There is also an active group on Mastodon. Cool stuff…

My thanks to N5CSU for these good pointers! LoRa, Meshtastic, and a related project called Reticulum, and Reticulum Network are all very active projects adjacent to Amateur Radio. To date, I haven't had the bandwidth to do any of them justice here in Zero Retries.

RPX-100 Project Final Result - It Seems to Have Just Faded Out

I've mentioned the RPX-100 Project a number of times here in Zero Retries3. It was a promising project to develop a Software Defined Transceiver for VHF / UHF with transmit power levels that would be useful for Amateur Radio activities. The RPX-100 was a project of the Austrian Amateur Radio Society (OEVSV) and was funded by a ~$63,000 grant from ARDC in 2022-03.

I had not heard of any followup on the RPX-100 and went to check on the website, and it's now offline. Fortunately, of course, there is the Wayback machine's last snapshot of the website, and a PDF of the last bit of the website on DLARC.

I queried ARDC about this project to see if they had any final reporting. The response I received was that there was some progress from this grant - a few prototypes were built, some hardware designs (especially the 6 meter / 2 meter / 70 centimeter 30 watt power amplifier) were developed, some testing was done, and at least one presentation. But in the end, a (readily) reproducible complete system was not completed.

Such is the nature of funding speculative Research and Development. Kudos to the team at OEVSV for attempting this project, and ARDC for funding this project. I've characterized ARDC as being "venture capital for Amateur Radio", and the outcome of the RPX-100 is representative of that characterization. Most of the time, venture capital investments are lost, but the trick is for the few venture capital investments that are winners more than compensate for the losers. Of course, the "return" for ARDC is purely psychic, that something new for Amateur Radio (or in general) is created. Thus it's encouraging to hear that ARDC had formed a new team to evaluate the results of awarded grants - the Grants Evaluation Team (GET). I hope the GET doesn't make ARDC more cautious in awarding speculative R&D grants… just better at *following up and reporting out the results* of awarded grants.

FOSDEM 2024 Talks Now Available

Email from Zero Retries reader Grégoire Détrez SA6DTZ:

> I think you've mentioned FOSDEM in the past, so maybe you know about this, but FOSDEM 2024 was a week ago and there was a "Software-Defined Radio and Amateur Radio devroom" (a devroom is FOSDEM's lingo for a community-organized track).
>
> The schedule for the devroom is available at https://fosdem.org/2024/schedule/track/radio/ and most of the videos for the talks have already been published there. I have only started watching, but there seems to be lots of interesting stuff: SDR, GNU Radio, satellites, M17, etc.
>
> Bonus (no radio): a fun anecdote on how FOSDEM was "saved" by 3D printing:
> https://blog.freecad.org/2024/02/08/freecad-ondsel-and-prusa-save-fosdem/

SA6DTZ understates how Zero Retries Interesting the "radio" devroom at FOSDEM 2024 was! There were 16 talks, and all of them I consider Zero Retries Interesting. The reality is I won't be able to watch all of them… but I wish I could. Just to give you a flavor of the ZRI content, here are three (that

I'll *make* time to watch):

- Maia SDR: an open-source FPGA-based project for AD936x+Zynq radios
- An open source digital radio protocol for amateur radio (A discussion of the M17 Project)
- DAPNET: Bringing pagers back to the 21st Century

And, an update on the potential GEO payload for Amateur Radio sponsored by ESA - see next article.

My thanks to SA6DTZ for this great info!

ESA Continues to Support Geostationary Satellite Project

From Amateur Radio Daily 2024-02-12:

> On Sunday February 4th, Frank Zeppenfeldt of the European Space Agency (ESA) gave a presentation at FOSDEM 2024 encouraging feedback from amateur radio operators on the subject of a potential follow-up geostationary satellite to QO-100.
>
> The satellite communications group of the European Space Agency (ESA) would like to support the collection of requirements, ideas and designs for a follow-up of [QO-100] in collaboration with IARU and various AMSAT communities. We would like to collect lessons learned and ideas on a QO-100 follow up, and trade-off some design together with amateurs, industry and ESA.

Links: Slide deck, Video of the presentation

Here are the near term milestones from the slide deck:

- March 2024 - Request input from amateur satellite community & other parties, guided by some from the AMSAT community.
- May 2024 - Have a few detailed payload options for discussion with the community at ESTEC, Netherlands – with technical support
- September 2024 - World [Space] Business Week (where all satellite operators meet). Organise discussions with operators.
- 2025 - Hopefully propose a few payload options at a next FOSDEM

In other news about this potential Europe + Eastern Canada GEO satellite or payload, Amateur Radio Satellites and Systems - Canada (AMSAT-CA) seems to still be in its initial organization stage.

Q0-100 is Not a Ham Satellite. (What is it ?)

This was an interesting article by Mario Badua Jr., KD6ILO of the San Diego DATV Society that explained in a compact format some of the significant challenges of an Amateur Radio payload at Geosynchronous Earth Orbit. KD6ILO seems to speak from considerable depth of experience. I recommend subscribing to this free newsletter as it regularly features Zero Retries Interesting stories such as this. [Minor reformatting by Editor.]

From KH6HTV's TV Rptrs Newsetter 155 - 2024-02-13:

> There was talk more among the private sector at their last East coast conference. Note: QO-100 is often referred to as a satellite. It's not. QO-100 is a hosted payload on a commercial communications satellite. That's important to understand. Intelsat does host payloads as long as they can meet specific requirements, weight, space accommodations (room) and don't forget power source (it's own) etc. There is no way we can have an Amateur Radio TV standalone satellite in GEO; it's just valuable space real estate, a costly endeavor. Again it's finding that "maybe we can host your package" kind of answer. It has to be a very robust package.
>
> Launching an Amateur Radio Satellite Digital TV Transponder Into GEO (Geostationary Earth Orbit) is no easy feat. It is a complex and expensive undertaking involving multiple challenges. Here is a breakdown of the difficulty:
>
> **Technical Challenges:**
>
> - **Sponsor Launch Vehicle:** You need a powerful and reliable launch vehicle capable of lifting your transponder (weight) and its fuel to a designated altitude of 35,786 km above the Earth's equator. *This requires significant engineering expertise and resources*.
> - **Orbital Maneuvers:** Reaching GEO is not enough. You need to precisely adjust the satellite's trajectory and speed to achieve a circular orbit at the correct altitude and over the desired longitude. This delicate process requires complex calculations and fuel expenditure.
> - **Station Keeping:** Once in GEO, *the satellite is not truly stationary*. Subtle gravitational forces and solar radiation pressure can nudge it off course. Maintaining its position within specified tolerances (usually < 0.1°) requires continuous thrusting using on-board propulsion systems, demanding fuel, and careful monitoring.
> - **Transponder Technology:** The transponder itself *needs to be robust and dependable*, operating flawlessly for years in the harsh space environment. It withstands extreme temperatures, vacuum, radiation, and micrometeoroid impacts. Additionally, your transponder design must comply with international regulations regarding spectrum allocation and signal characteristics.
>
> **Financial Challenges:**
>
> - **Launch Cost:** Launch costs are substantial, ranging from tens to hundreds of millions of dollars depending on the vehicle and mission complexity.
> - **Satellite Development:** Building a sophisticated transponder with all the necessary components and systems is expensive, *requiring*

specialized engineering teams and materials.

- **Ground Infrastructure:** You need ground stations for communication and control of the satellite, adding to the overall cost.
- **Regulatory Compliance:** Obtaining licenses and complying with international regulations can be a lengthy and expensive process.

Competition:

- **Limited Slots:** GEO orbit is a crowded space with limited vacant positions. Obtaining the rights to a specific longitude slot can be challenging and expensive.

In Conclusion

Placing a satellite digital TV transponder in GEO orbit is a demanding and expensive endeavor. It requires significant technical expertise, financial resources, and careful planning. However, advancements in technology and a growing demand for satellite TV in certain regions can make it feasible for ventures with the necessary capabilities and market strategy.

Remember, this is just a general overview. The specific difficulty depends on several factors like the transponder's size, launch vehicle used, target region, and existing competition for that GEO space.

NEW PRODUCT ANNOUNCEMENT - 23 cm, 2 Watt, Digital ATV Amplifier - $325

This was mentioned in the same issue as the above article.

The KH6HTV-VIDEO Model 23-12A, RF Power Amplifier is for use in the amateur radio 23 cm band. It is a Class A-B amplifier designed for linear service. It can produce a 2 Watt, high-definition (1080P), digital TV (DTV) signal. It can also be used to produce an 10 Watt (pep), analog TV or SSB signal, or 15 Watts for FM/CW service. For DTV service with it's low DC current draw of only 1.0 Amp at 13.8 Vdc, it is ideal for in the field battery operations, such as for ARES emergency operations. With its heat sink and fan it is rated for 100% duty cycle.

For detailed specs, go to: https://kh6htv.com/products/

To see an image of the Model 23-12A, see Page 11 of the link above.

Discovery Dish (Pre-production) Updates

While I'm leery of backing a project on Crowd Supply that isn't yet in production (based on a previous experience doing so), Crowd Supply seems to be the popular choice for interesting radio technology crowdsourced projects, such as Discovery Dish. In addition to the original Discovery Dish and Mount, they're now proposing a number of specialized feed units, an on-pole rugged outdoor electronics enclosure, and an early mention of a potential automatic Azimuth / Elevation rotor unit:

> Unlike the much heavier Wi-Fi grid dishes that are typically used, the lightweight design of Discovery Dish makes it suitable for a light-duty and low-cost (sub-$200) automatic antenna rotator, which we are currently in the very early stages of designing, and may release on Crowd Supply in the near future as a separate campaign. The rotator will be designed to be used outside with a Raspberry Pi or Orange Pi acting as the hamlib rotctl serial controller, enclosed further down the mount in the electronics enclosure. As mentioned, because Discovery Dish is so lightweight, we can use DC motors that work on the power available from standard PoE. Stay tuned for more information coming soon!

The Magic Band Revealed, 3rd Edition

Bob Witte K0NR:

> Jim Wilson K5ND recently completed the third edition of the book Magic Band Revealed. Of course, I had to read it and I surely did enjoy this book. Jim hits all of the different operating and propagation modes that hams use on 50 MHz: sporadic-e, F2, TEP, meteor scatter, ionoscatter, etc. The WSJT-X modes have had a huge impact on what's possible on the band, so Jim provides a good overview of the various options (FT8, FT4, MSK144, Q65). Jim also provides some helpful information on VHF contests and operating as a rover.
>
> The best attribute of the book is that it is primarily written as a first-person account of K5ND's operating experiences. Reading the book is just like having a friend tell you about what they've experienced on the band, along with some great operating tips. Great work, Jim!
>
> The book is available as a free PDF download from Jim's website or in print version via Amazon.
>
> Go to https://k5nd.net/2023/11/magic-band-revealed/

There *is* a certain magic about the 6 meter band. My favorite story about 6 meters is that when I was living in the Cleveland, Ohio area I monitored a conversation (on a 2 meter repeater) between two Amateur Radio Operators about a new addition to their "big" 6 meter repeater in the Cleveland area - a "remote" receiver had just been installed… *in Ann Arbor, Michigan!* Turns out the folks that sponsored this 6 meter repeater were all involved in the television broadcast industry and had access to very tall television broadcast towers, were comfortable working with a 6 meter transmitter operating at hundreds of watts, and "piggybacked" the audio for the remote receivers via the television station's interconnections with their sister stations in the region.

At least that's how I remember the story, decades ago now.

ARDC's 44Net Virtual Private Network Service - Coming… *Soon?*

Draw your own conclusions. I cannot find any mention of this on the ARDC website… and frankly, it baffles me that ARDC staff is willing to discuss it publicly, that an Amateur Radio YouTube video be the only "open" mention of this service, but no mention of it by ARDC on their website, press release, newsletter, etc.

Yes, there is the OH7LZB VPN page on the 44Net Wiki, but if you're skilled enough to implement what's described there, you're probably skilled enough to already have a virtual private server running as an endpoint for your 44Net activities.

My thanks to my friend Ren Roderick K7JB for mentioning this.

Leave a comment

Share

Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, check out
Join the Fun on Amateur Radio for some pointers.

Zero Retries Frequently Asked Questions (FAQs) — In development 2023-02.

Closing the Channel

In its mission to highlight technological innovation in Amateur Radio, promote Amateur Radio to techies as a literal license to experiment with radio technology, and make Amateur Radio more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to everyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex, which hides Amateur Radio content behind paywalls.

My ongoing ***Thanks*** to:

- Tina Stroh KD7WSF for, well, *everything!*
- ***Founding Members*** **who generously support Zero Retries financially:**
  Founding Member 0000 - Steven Davidson K3FZT
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  Founding Member 0002 - Chris Osburn KD7DVD
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- The *most* effective way to support Zero Retries is to simply mention Zero Retries to your co-conspirators that are also interested in knowing more about technological innovation that is occurring in Amateur Radio and encourage them to become a fellow subscriber.

- One particularly effective method of promoting Zero Retries is to add a mention of Zero Retries to your QRZ page (or other web presence) and include a link:

  https://www.zeroretries.org

- If you'd like to financially support Zero Retries, becoming a paid subscriber is *greatly* appreciated and helps offset expenses incurred in publishing Zero Retries. Paid subscriptions for Zero Retries are *entirely optional*, as explained in this special issue of ZR:
  Zero Retries Administrivia - Activating Payment Options.

These blogs and newsletters regularly feature Zero Retries Interesting content:

- Dan Romanchik KB6NU mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- Jeff Davis KE9V also mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- Amateur Radio Weekly by Cale Mooth K4HCK is a weekly anthology of links to interesting Amateur Radio stories.
- Experimental Radio News by Bennet Z. Kobb AK4AV discusses (in detail) Experimental (Part 5) licenses issued by the US FCC. It's a *must-read-now* for me!
- RTL-SDR Blog - *Excellent* coverage of Software Defined Radio units.
- TAPR Packet Status Register has been published continuously since 1982.
- Other Substack Amateur Radio newsletters recommended by Zero Retries.

These YouTube channels regularly feature Zero Retries Interesting content:

- HB9BLA Wireless by Andreas Spiess HB9BLA
- KM6LYW Radio by Craig Lamparter KM6LYW (home of the DigiPi project)
- Modern Ham by Billy Penley KN4MKB
- Tech Minds by Matthew Miller M0DQW

Zero Retries is currently using the Substack email publishing platform to publish Zero Retries. It's particularly suitable for small newsletters as you can get started for no cost.

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Zero Retries (N8GNJ) is on Mastodon — n8gnj@mastodon.radio — just click:

Zero Retries / N8GNJ on Mastodon

Zero Retries (N8GNJ) is also on Bluesky — @n8gnj — just click:

Zero Retries / N8GNJ on Bluesky

Email issues of Zero Retries are "instrumented" by Substack to gather basic statistics about opens, clicking links, etc.

More bits from Steve Stroh N8GNJ:

- SuperPacket blog — *Discussing new generations of Amateur Radio Data Communications — beyond Packet Radio (a precursor to Zero Retries)*
- N8GNJ blog — *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs — Bellingham, Washington, USA*

Thanks for reading!
Steve Stroh N8GNJ / WRPS598 (He / Him / His)
These bits were handcrafted (by a mere human, not an Artificial Intelligence bot) in beautiful Bellingham (The City of Subdued Excitement), Washington, USA, and linked to the Internet via **Starlink *Satellite* Internet Access**.

2024-02-16

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Blanket permission granted for TAPR to use any Steve Stroh content for the TAPR Packet Status Register (PSR) newsletter (I *owe* them from *way* back).

1

Imaginary URL, used here solely for illustration of the concept.

2

From my personal memory, "digipeater" was invented during the creation of Packet Radio technology to describe digital (data) receive-buffer-retransmit communications using a single frequency. Digipeating became popular because it was included in every "Terminal Node Controller" (TNC) based on the TAPR TNC-2 (and perhaps earlier TNCs). While there is a similar technology for analog voice called "simplex repeater" which also receives, buffers, then retransmits a voice transmission on a single frequency, it's not widely used.

3

Significant mentions of RPX-100 in Zero Retires:

- **Zero Retries 0035** - A Radio for US Amateur Radio Data Network
- **Zero Retries 0060** - Zero Retries 0060 Omnibus of Zero Retries Interesting Information - 2. RPX-100
- **Zero Retries 0087** - RPX-100 Update
- **Zero Retries 0106** - The Ten Most Zero Retries Interesting Projects - Summer 2023 - Part 1 - RPX-100 - Software Defined VHF / UHF Radio with Reasonable Transmit Power
- **Zero Retries 0136** - Reimagining Amateur Radio Part 2 - Data Appliance - RPX-100